THE X-RAY DIAGNOSIS OF DISEASES OF THE NASAL ACCESSORY SINUSES, WITH SPECIAL REFERENCE TO SPHENOID AND ETHMOID DISEASES

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Mapping of the ethmoid sinuses within definite bony landmarks is an uncertain method in many cases.

Steroscopy of the paranasal sinuses is a valuable method which should not be discontinued.

A comination of Granger's 107° angle with a 5-inch upward tube shift at 40-inch distance through a small dental cone, with a lateral and a Waters projection in addition gives the most useful information regarding the paranasal sinuses.

DISCUSSION *by Robert R. Newell, San Francisco; Frederick H. Rodenbaugh, San Francisco; James B. Bullitt, San Jose; H. J. Ullmann, Santa Barbara.*

THE need for a standard method of sinus radiography is great. The fact that so many methods are in use is proof of the inadequacy of any of them. While some difference of opinion occurs in the interpretation of maxillary and frontal sinus conditions most of the controversy centers about the sphenoidal and ethmoidal cells. As the condition of these cells is most difficult to diagnose clinically, it is important that the radiologist render accurate information. Frequently, too, errors in ethmoid interpretation are not uncovered due to their inaccessability, which leads the radiologist into a routine which cannot fail in time to cast discredit upon the method and its value. A glance at the ethmoid capsule removed from the dried skull will show a complicated labyrinth of thin-walled cells which have completely honey-combed the bone. Indeed, sometimes even the wings of the sphenoid, the maxillae and the nasal bones are invaded as well as the middle turbinate bones. These multitudinous cells, unlike the mastoid, are completely surrounded by the bones of the face and skull. To correctly interpret bony thickening, erosion and exudate is difficult and, at times, impossible. A radiograph, made in any direction, will represent the superimposed shadows of from four to fifteen cells, in addition to those of the enveloping structures. Mastoid interpretation is easy in comparison as the cells can be uncovered without difficulty.

In an attempt to determine by which method or methods the most information could be obtained, I have studied the methods of Van Zwaluwenberg, Pfahler, Blaine, Grier, and Granger. Van Zwaluwenberg introduced the vertical stereoscopic shift which greatly aided symmetry. Pfahler projected the ethmoids and sphenoids vertically downward on an intra-oral or extra-oral plate. This method appears to have value in sphenoid interpretation, but has been found most confusing in ethmoid conditions as the ethmoid cells nearly always appear opaque. Blaine's method for standardizing sinus technique includes the 23° angle. The Waters position, a vertical extra-oral position advocated by Law, and a lateral view. He excludes stereoscopy and depends on 23° angle for the ethmoid shadows. Grier omits the Waters position and the lateral, taking four postero-anterior plates, each one stereoscoping with the next—an excellent method, but incomplete, in being all in one direction, antero-posterior.

The exhaustive study of Granger has been found mose useful. In brief, his method consists in using a perforated plate-changing tunnel with a hole for the nose, the head resting on the glabella and the alveolar process of the superior maxilla. One antero-posterior view is made on a 23° angle board. Another is made on a reversed 17° angle board. One lateral projection is made. Granger, by standardizing the position, holds that the ethmoid and sphenoid cells will fall within definite areas limited by bony landmarks and checked by comparing corresponding areas on the three different exposures. He also called attention to the curved line of the upper margin of the sphenoid in the 107° angle, mentioning that a thickening of this line meant hyperplasia, an absence, fluid, or polyps. While I have found these contentions to a certain extent true, certain difficulties arise in using the method unmodified. They are:

1. The exclusion of stereoscopy.

2. The normal variation of skull angles precludes absolute standardization of the 107° angle. In an examination of but a few specimens I have found a 15° variation, which is enough to alter the position of the curved line.

3. There is a normal variation in the thickness of the curved lines due to difference in degree of pneumatization of the sphenoid body.

4. A posterior ethmoid may and frequently does overly the sphenoid and underly the curved lines.

5. It is impossible to accurately map the ethmoid cells within prescribed boundaries due to differences in degree of pneumatization, the posterior ethmoids often invading the anterior ethmoid region and vice versa.

6. In the Granger 107° angle position, the ethmoids are obscured by the frontal, sphenoid and basilar portion of the occipital bone.

7. In the 23° angle plate they are obscured by the nasal bones, turbinate bones and the lower half of the antrum by the petrous portion of the temporal bone.

After many trials I became convinced that accurate ethmoid and sphenoid interpretation was more nearly possible with the stereo. method and adopted the 107° angle plate with the addition of an upward tube shift, the patient being erect to bring out fluid levels.

It was found that at normal distance, 22 inches, the second plate gave a projection similar to the 23° angle position and an excellent view of the ethmoid capsule, uncovered, but not of the sphenoids in all cases. At the suggestion of Drs. Chamberlain and Newell of Stanford University Hospital, the tube plate distance was increased to 40 inches, which brought out shadows at a distance from the plate. It was found, however, that at this distance a 2½ inch shift gave little displacement of the petrous portion of the temporal bone and the ethmoids were not sufficiently uncovered to be ideal. The shift was changed to 5 inches and the result was

found to be most gratifying, as one plate gave Granger's 107° angle position with the curved line and the other gave an excellent view of the ethmoid capsule. Viewed singly much was added to the ethmoid and sphenoid study and viewed together, it was found that the accommodation of the eyes gave a stereoscopic image quite as good as with the 2½ inch shift, but with a much more favorable uncovering of the pneumatic structures. All plates are made 40 inches in the erect position, using a small dental cone. The Bucky has not been found necessary. Indeed, the films appear clearer without it. A very definite idea of the ethmoid structure can be obtained both as to density and hyperplasia. The sphenoids are clearly brought out. A lateral view is added to determine the depth of the frontals and as a check on the location of ethmoid or sphenoid density. The Waters position is substituted for Granger's 25° angle position as the writer believes more information is obtained.

CONCLUSION

1. Mapping of the ethmoid sinuses within definite bony landmarks is an uncertain method in many cases.

2. Stereoscopy of the paranasal sinuses is a valuable method which should not be discontinued.

3. A combination of Granger's 107° angle with a 5-inch upward tube shift at 40-inch distance through a small dental cone, with a lateral and a Waters projection in addition, gives the most useful information regarding the paranasal sinuses.

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DISCUSSION

ROBERT R. NEWELL, M. D. (Stanford University Hospital, San Francisco)—Dr. Powers has gone ahead with the specialized x-ray study of the ethmoids and sphenoid. I, too, have adopted Van Zwaluwenberg's method of 40-inch distance and sagittal stereo. shift for the ethmoids. I would be very unwilling to give up the stereo., however much Granger may have taught us about the appearance of the sphenoid and ethmoids on single films. It seems to me worth while to take the films with the patient sitting, as does Powers, in order to show fluid as different from soft tissue filling the sinuses. I have found it worth while also to make one horizontal ray exposure with the patient lying on his side. Free fluid will gravitate to the dependent portion of the sinus and demonstration of this shifting proves that the observed density is in fact due to fluid and nothing else. I am using the Bucky diaphragm for routine sinus studies, believing that the contrast is thereby improved. I must agree with Dr. Powers that it is not essential, however. I continue to depend on the Waters position for the best x-ray evidence in regard to the maxillaries.

FREDERICK H. RODENBAUGH, M. D. (516 Sutter Street, San Francisco)—I have been greatly interested in observing Dr. Powers' demonstrations of sinus technique, and feel certain that he has done much to clarify the difficult phases of accessory sinus disease.

My practice has been to use Van Zwaluwenberg's technique in the examination of ethmoids and sphenoids, and it has been satisfactory. It is my impression that familiarity with the method will enable one to determine, with a fair degree of accuracy, the presence of ethmoid and sphenoid disease. In addition I have used a mouth film for a sagittal projection of sphenoids which has been helpful in determining the size of sphenoids, and their comparative densities. The diagnosis of ethmoid disease has not been successful with mouth films. As a routine I have not used the Bucky diaphragm, and have not felt the necessity for its use after comparisons.

Doctor Powers is to be congratulated on the technical accuracy of his work and very interesting group of cases he has presented.

JAMES B. BULLITT, M. D. (Garden City Bank Bldg., San Jose)—The difficulties attending the study of paranasal sinuses are generally recognized by roentgenologists who have strongly felt the need of improved methods in the examination, especially of the spenoidal and ethmoidal cells. Therefore the proposals of Granger were received with great interest, although his conclusions are yet to be confirmed. Powers disputes Granger's statement that with the 107 degree angle it is possible to make strikingly similar radiographs of very differently shaped heads. Powers in a few specimens finds a variation of as much as 15 degrees. As Granger's findings are primarily and largely based on the correctness of this proposition, it is to be hoped that further and accurate studies will soon appear dealing with this phase of the subject.

Powers' idea of using Granger's angle board position at a distance of forty inches and combining with it the making of stereoscopic plates with vertical instead of lateral shift, as proposed by Van Zwaluwenberg, appears most logical.

Doctor Powers' proposal appears to be a distinct advance toward the goal of a better exposition of the pathology of the sphenoidal and ethmoidal regions.

H. J. ULLMANN, M. D. (Santa Barbara Cottage Hospital, Santa Barbara)—I was much interested to hear that Dr. Powers had not been able to get essentially similar pictures with the Granger position. So far I have been fortunate in being able to do so, and it will be a blow to find that I cannot. Since using the Granger position and his recommended 107 degree angle, I have felt considerably happier in attempting to interpret films of the sphenoidal region, but the ethmoids still remain a great trial and stumbling block. Doctor Powers' method of combining the glabellar-maxillary position with a 40-inch distance and vertical stereo. shift appeals to me strongly and I am going to give it a trial.

DOCTOR POWERS (closing)—I hope that I have not given the impression that the method I am using is an easy solution of the ethmoid and sphenoid problem. It is simply an attempt to combine the best of many methods on four plates and has been found to be an improvement in my hands. Special cases will require more, such as the vertical intra-oral method in certain hyperplastic sphenoid cases.

Isthmospasm of the Fallopian Tube—Isthmospasm of the fallopian tube is described by W. T. Kennedy, New York (Journal A. M. A.), as being an obstruction between the meeting of the ovum and the spermatozoa and may be the only obstruction preventing the passage of a fertilized ovum from the tube into the uterus—a predisposing factor in ectopic gestation. Isthmospasm is one condition that will explain selective sterility. Attenuation of an isthmospasm would explain some conceptions. Isthmospasm exists in some women complaining of sterility or sterility and dysmenorrhea, and is frequently associated with anteflexion. Isthmospasm is caused by the improper balance of the autonomic and sympathetic innervations, either the autonomic being in excess or the sympathetic being deficient. A tube, having an apparently normal ampulla and no evident abnormality of the isthmus, even though it obstructs the passage of carbon diovid gas by insufflation, should not be removed at operation because we may render a patient permanently sterile who is now only temporarily so.

Raynaud's Disease Complicated With Gastric Ulcer—The case reported by Julius Friedenwald and William S. Love, Baltimore (Journal A. M. A.), presents a typical instance of Raynaud's disease complicated with gastric ulcer. While it is most difficult to demonstrate a definite relationship existing between the two affections as occurring in the same patient, it is extremely interesting to note, and it is quite possible to conceive, that both may have originated in a vascular spasm. That similar spastic manifestations of the blood vessels occur in the internal organs in Raynaud's disease is revealed in the well observed attacks of hemoglobinuria and of abdominal colic noted at times in this affection.